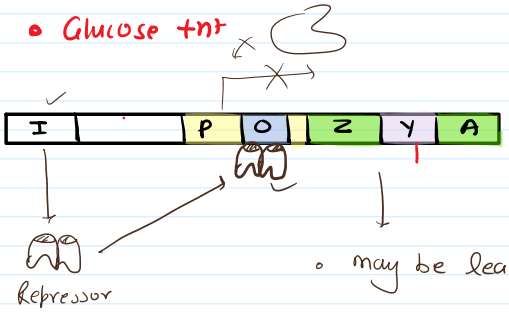
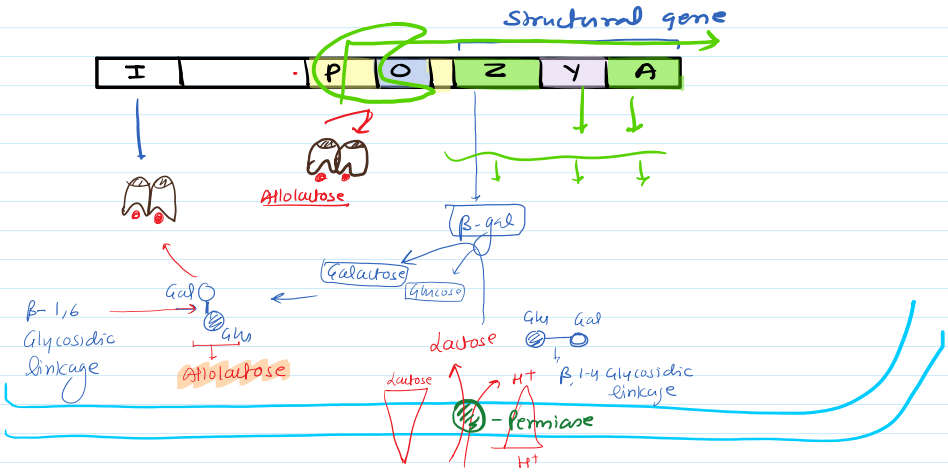
- Lactose -nt
- Glucose +nt



- may be leaky Transcription occurs
- 0-1 Transcript / min
- few permease & β Gal may be +nt

Condition 2

- Lactose +nt
- Glucose -nt



Allolactose has ↑ affinity with Repressor

↓

Allolactose Binds with Repressor & brings the Conformational Change in Repressor

↓

Repressor dissociates from operator

↓

Expression start

Allolactose → Natural Inducer [Induce Expression of gene]

→ in Artificial Expression System → IPTG is used As artificial Inducer

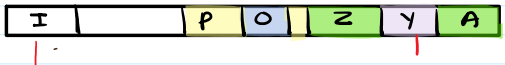
IPTG – Artificial Inducer

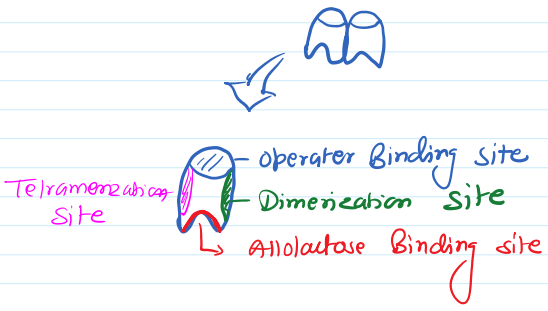
↳ Isopropyl Thiogalactosidase]

↳ Small & non-polar
↳ Can cross p.m. without need of Transporter
↳ ↑ Affinity with Repressor
↳ analog of Allolactose

→ IPTG Gives at 16°C in Broth Culture for gene Expression

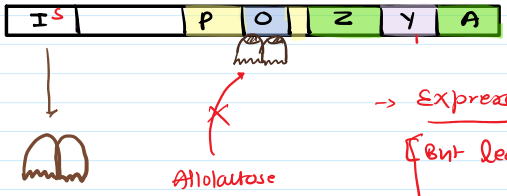
#





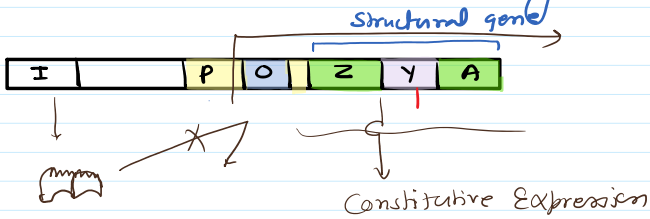
if Allolactos Binding site is mutated
↓
Repressor become Super repressor

Super repressor [Gain of Function]



→ Expression - off
[But leaky Transcription can be seen

② if loss of function in Repressor
↳ mutation in DNA Binding site



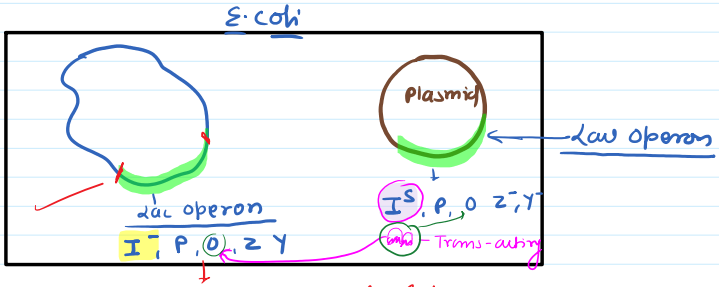
③ if loss of function in operator [O^c]
↳ Can not Binds with Repressor
↳ Constitutive Expression Can be Seen

Inducer +nt Inducer -nt

↳ Constitutive Expression can be seen

	Inducer +nt		Inducer −nt	
	Z	Y	Z	Y
① I^s, P, O, Z, Y	−	−	−	−
② $I\ P\ O^c, Z, Y$	+	+	+	+
③ $I\ P\ O^c\ Z^-\ Y$	−	+	−	+
④ $I^s\ P\ O^c\ Z, Y$	+	+	+	+
Oc is dominent over I^s				
⑤ $I^s\ P^-\ O^c\ Z\ Y$	−	−	−	−
⑥ $I\ P\ O\ Z\ Y$	+	+	−	−
⑦ $I\ P\ O\ Z\ Y^-$	+	−	−	−

Merodeploid (Partial Deploid)



Merodeploid

$I\ P\ O\ Z^-\ Y / I^s\ P\ O\ Z\ Y$

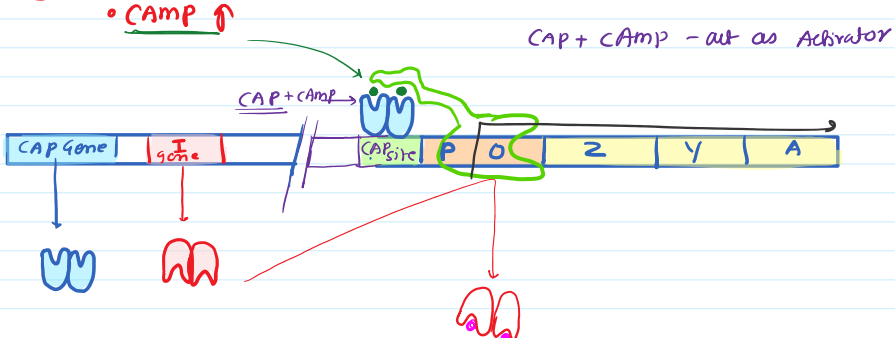
$I\ P\ O^c\ Z^-\ Y / I^-\ P\ O\ Z^+\ Y^-$

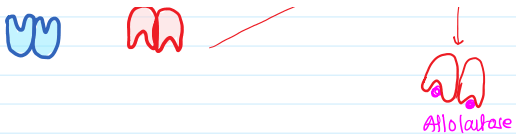
	Inducer +nt		Inducer −nt	
	Z	Y	Z	Y
	−	−	−	−
	✓	✓	−	✓

Z − Inducible Expression
Y − Constitutive "

* Role of Catabolite activator protein [CAP]

① Glucose −nt, Lactose +nt
• cAMP ↑

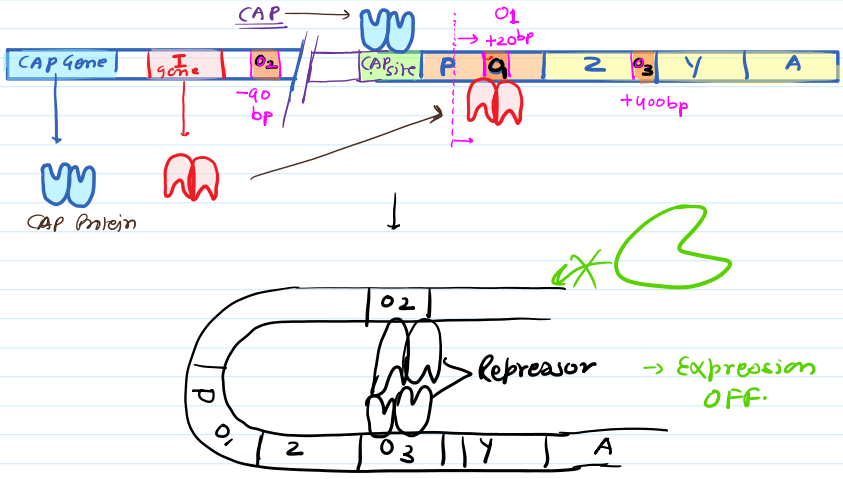




CAP / CRP
- cAmp Receptor protein
- catabolite activator protein

Condition 2

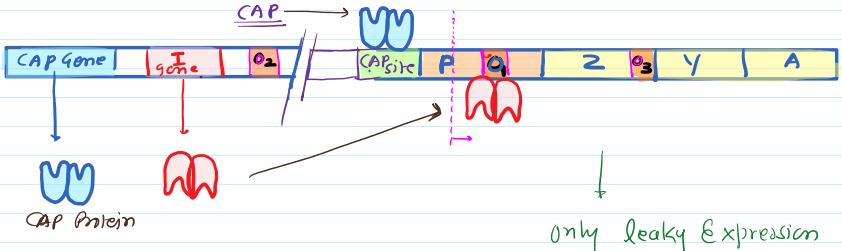
Glucose +nt
Lactose −nt
] cAmp ↓



Condition 3

- ~~Glucose +nt~~
- Lactose +nt

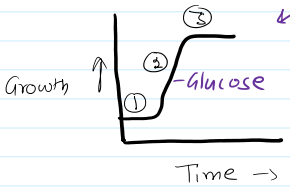
] → cAmp level ↓



only leaky Expression Can be seen

When Glucose in Consumed
↓
Lac operon start

Bacterial Growth Curve

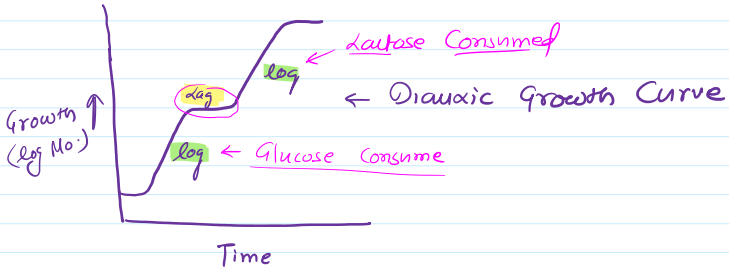


only Glucose tnt in medium → due to tnce of Glucose lag phase is almost Negligible

① Lag → Acclimation period
② log (Exponential) – Growth
③ Stationary → Birth rate = death Rate

Condition 2

when Glucose + Lactose tnt in medium



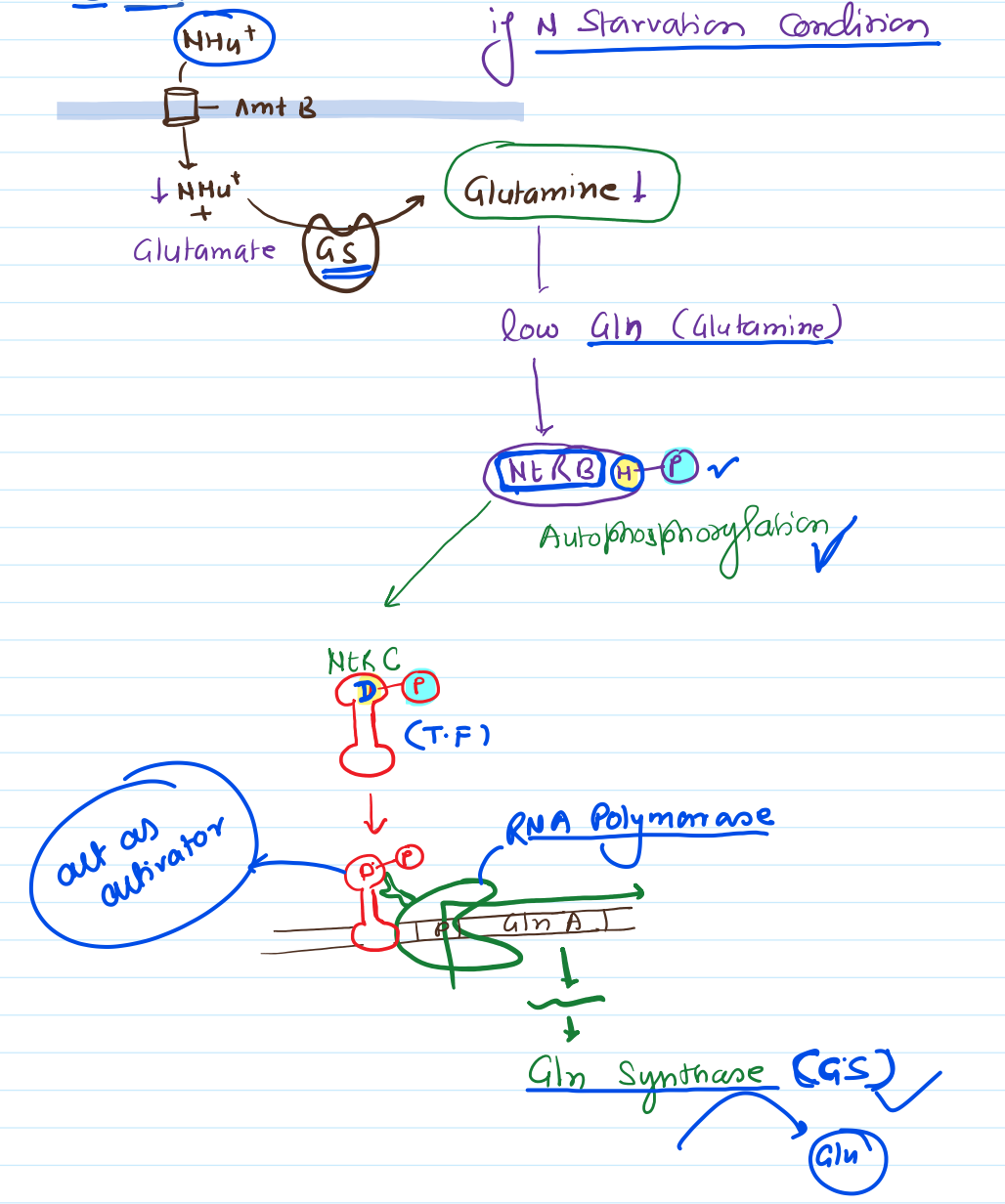
Lac operon

- Catabolite operon ✓
- Inducible ✓
- Negative Regulation ✓

Positive Regulation of Transcription -

eg - Nitrogen Starvation Condition -

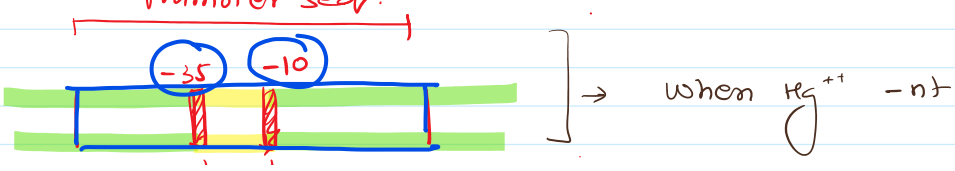
in E.coli

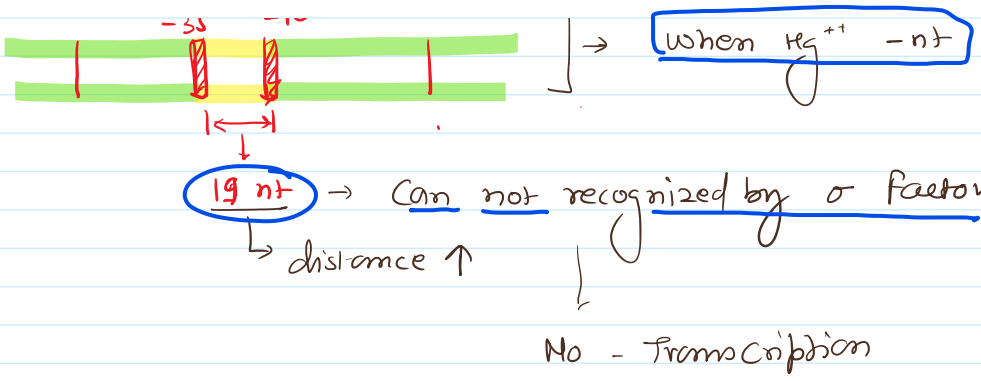


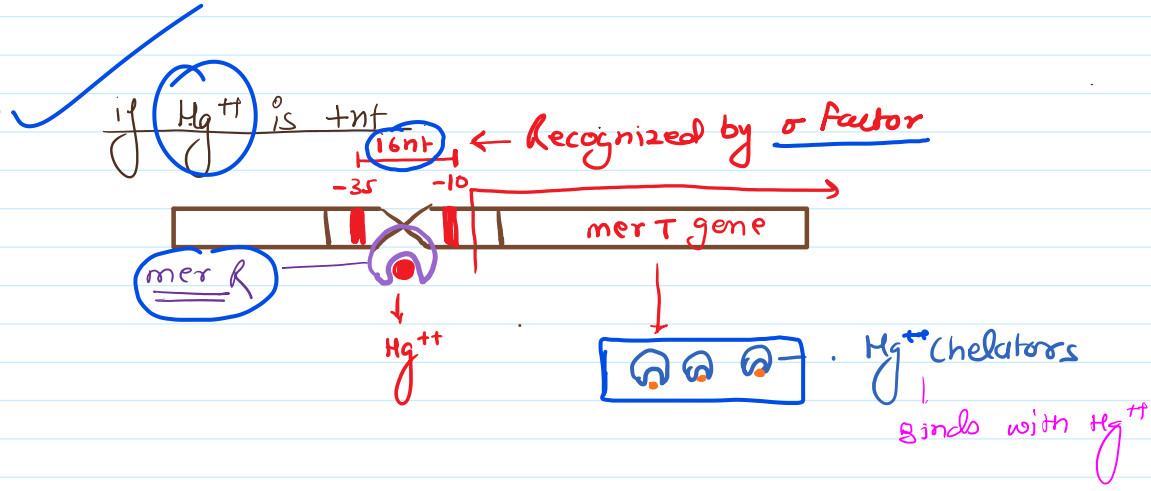
Mer-T Operon

✓ $[Hg]^{++}$ ↑ → Operon - ON

✓ $[Hg]^{++}$ ↓ → Operon - OFF





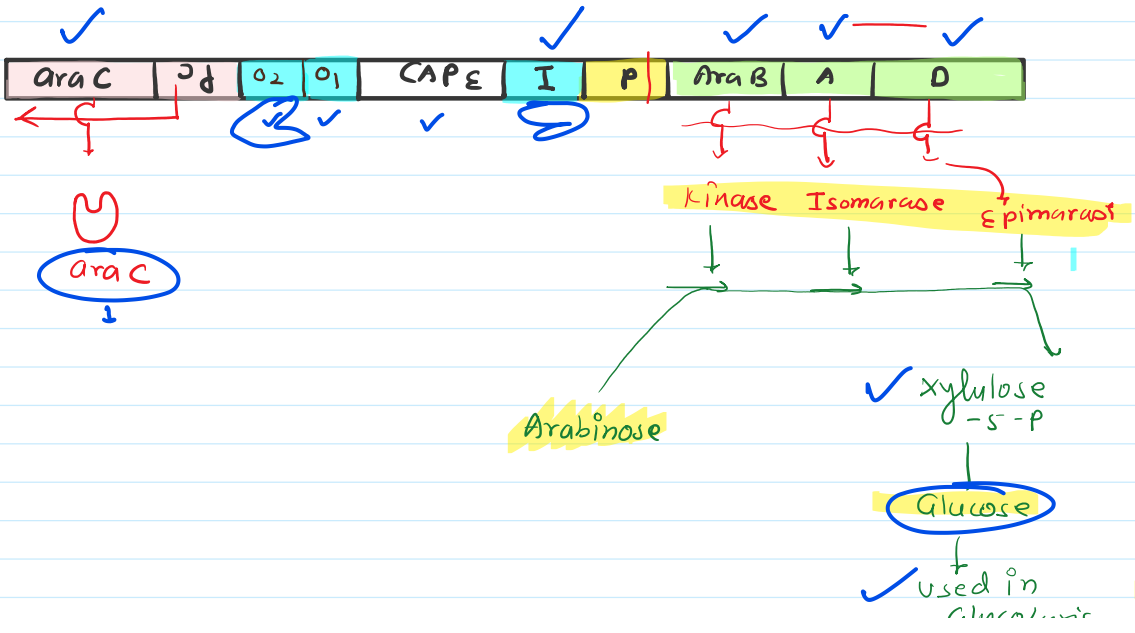


Imp

Arabinose operon

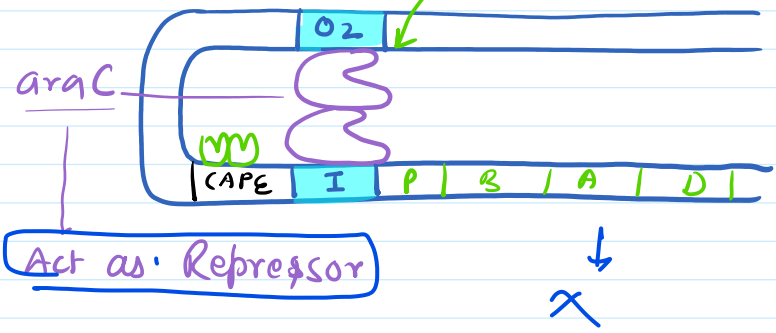
- Catabolite operon
- Inducible operon
- Strongest promotor among Prokaryote
- +ve Regulation & -ve Regulation

Ara C = Activator & Repressor



① -ve Regulation of Ara C

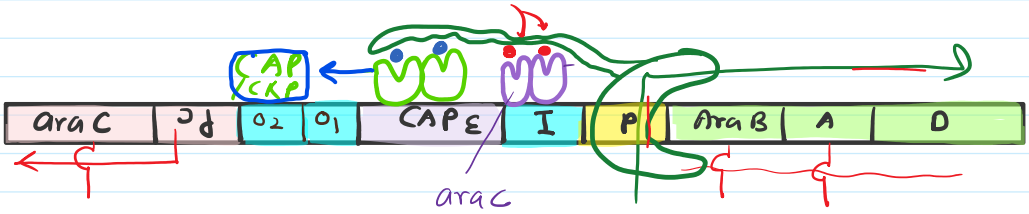
- Glucose +nt → cAMP↓
- arabinose −nt



Act as Repressor

Condition 2 → +ve Regulation

- Glucose −nt → cAMP↑
- Arabinose +nt



araC Binds with arabinose → Act as activator

→ ara C – Act as Activator – Arabinose +nt

ara C – " " Repressor – " −nt

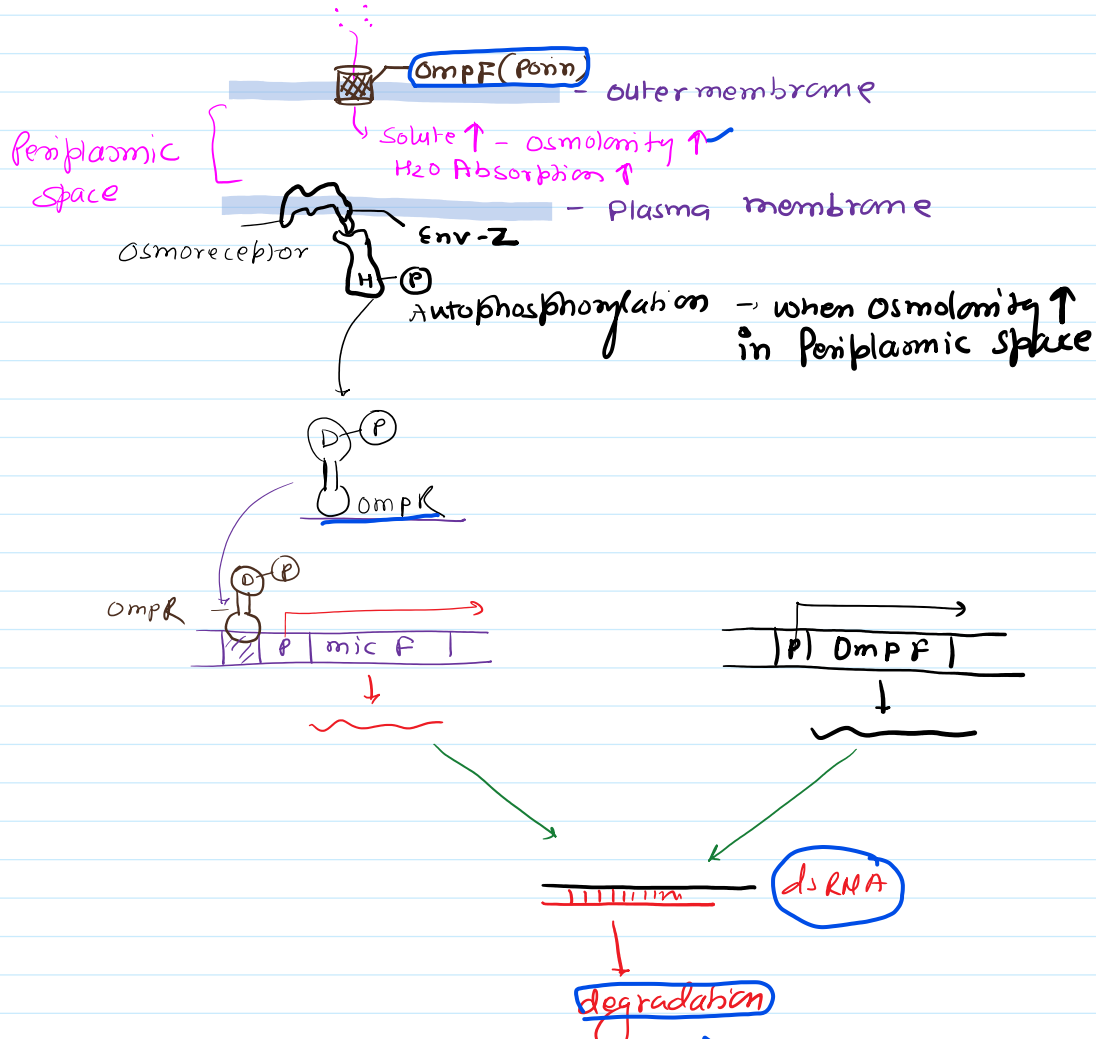
* Prokaryotic gene Regulation-

① Transcription initiation level

- ✓ Lac-operon
- ✓ NtRC
- ✓ merT
- ✓ Ara C

② Post Transcriptional gene Regulation

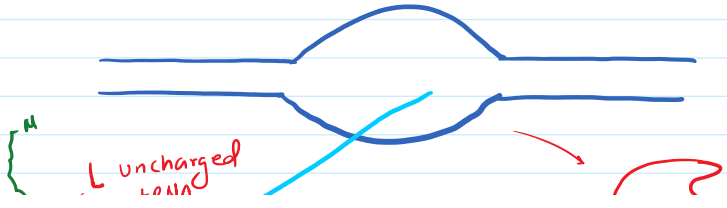
eg- E. coli

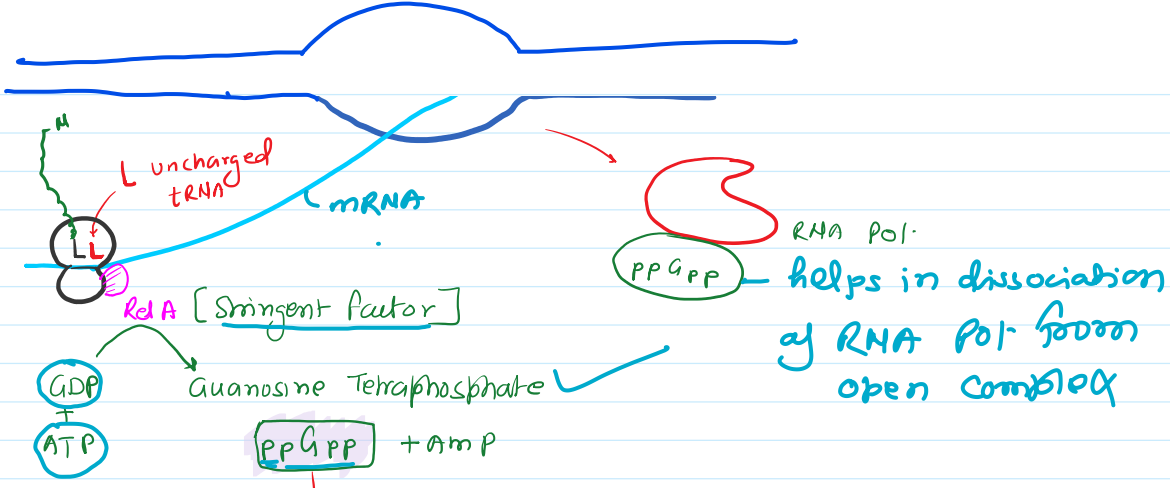


- OmpF Expression ↑ when Osmolarity is very low
- OmpF " ↓ " " " " high

Regulation of Transcription in Starvation Condition / Stringent Condition

- Global Transcription inhibition ✓
  - → a.a. Starvation ✓
    - Charged tRNA ↓ ✓
    - Uncharged tRNA ↑ ✓





magic factor ⊣ rRNA Transcription

⊕ → tRNA ~

⊕ → mRNA Transcription

– involve in a.a Biosynthesis

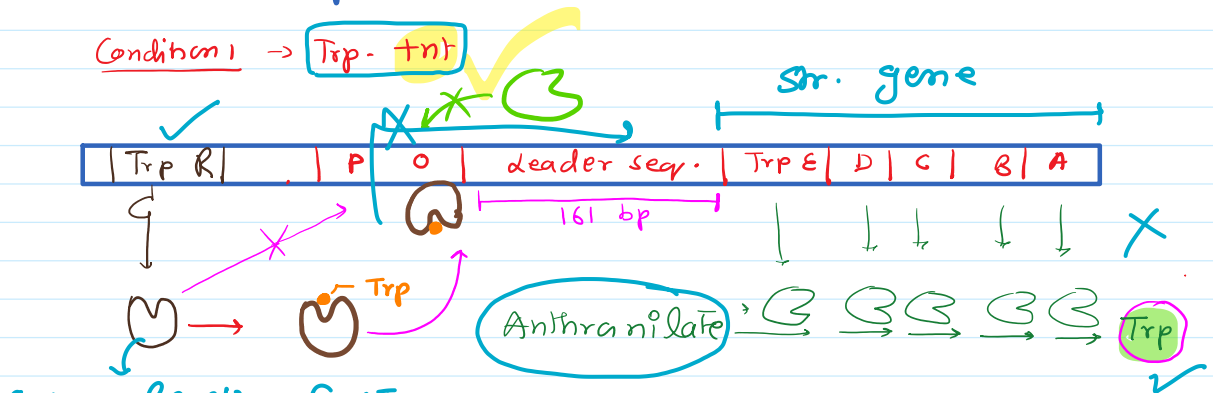
Post Transcriptional Regulation -

→ Regulation after Transcription initiation

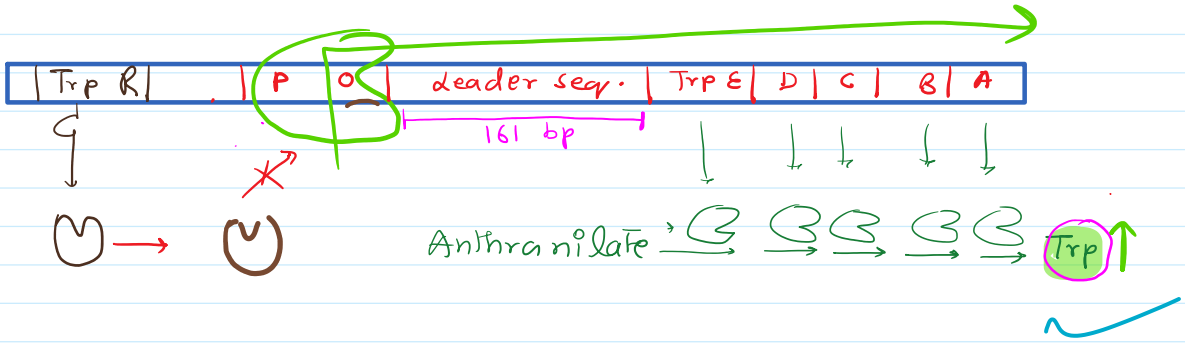
Eg - Trp Operon

- Anabolic operon
- Responsible for Biosynthesis of trp. a.a
- K/a Repressible operon
- 2 Step Regulation (Repression)

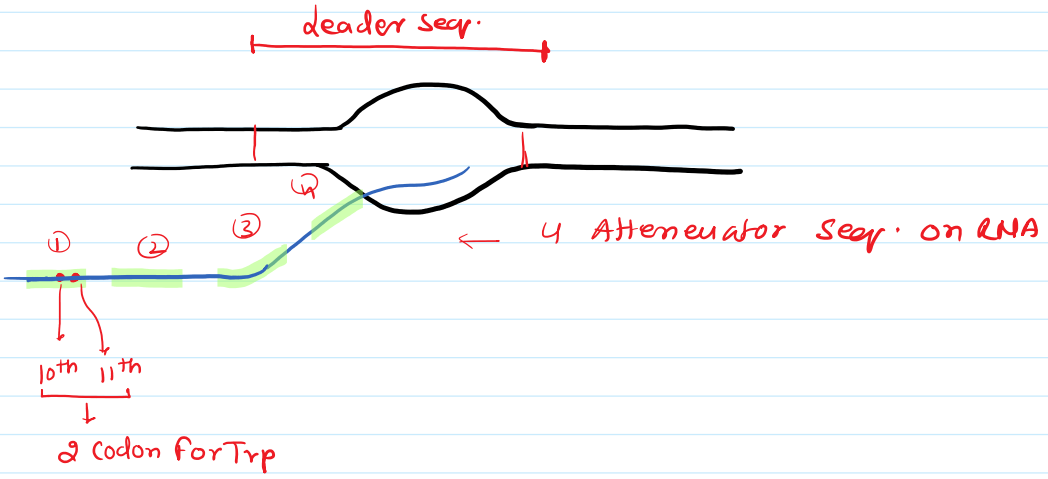
✓ Trp Repressor | Attenuation



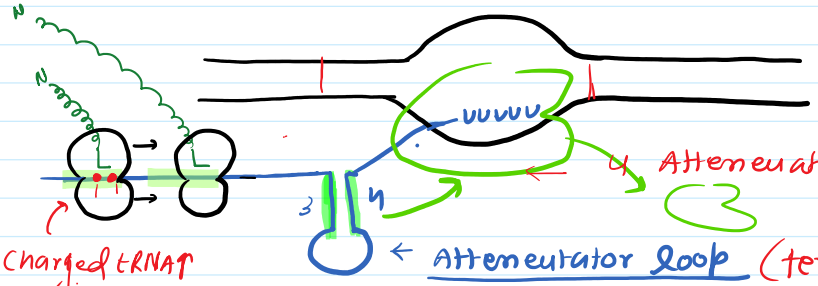
Condition 2 - Trp ↓



Regulation Through leader seq.



(1) Trp Conc. ↑↑



· on RNA

· Charged tRNA↑

· Translation speed ↑

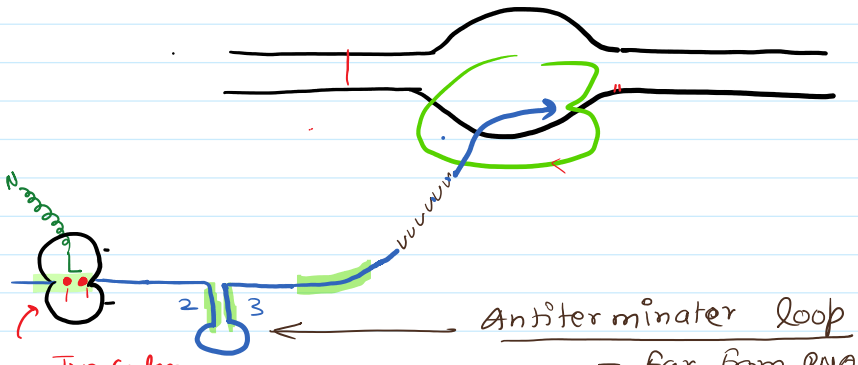
· Ribosome moves imidiately from 1 attenuator to another attenuator seq.

← Attenuator loop (terminator loop)

- hair pin loop followed by Poly U seq.

· Pairing of 3rd - 4th → Terminator loop

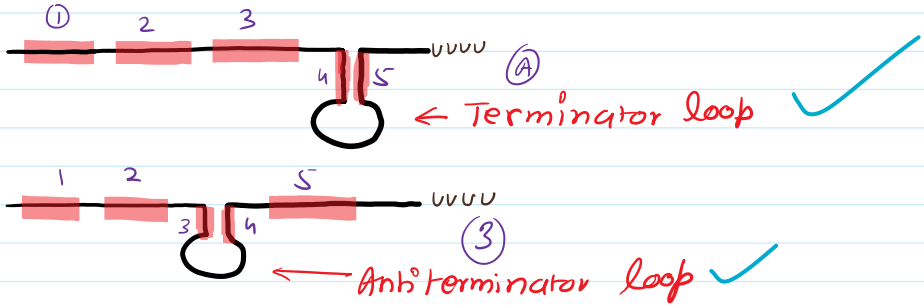
Condition 2 = if Trp level ↓



Antiterminater loop
– far from RNA Pol.

Trp codon

- Charged Trp tRNA ↓ ✓
- Ribosome will wait for Charged Trp tRNA



← Terminator loop ✓

← Antiterminator loop ✓

if Trp codon is replaced with Ser codon

↓

Now Trp operon can be regulated by Conc. of Ser.